

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION



TITLE OF THE PROJECT:

**Investigating the challenges faced by schools in teaching and learning of Ordinary Level
Biology. Case of Siabuwa cluster of schools, Binga.**

Name of Author: Chawarura Bothwell

Registration Number: B1027476

PC 307 Research Project

DEGREE FOR WHICH PROJECT WAS PRESENTED:

Bachelor of Science Education Honours Degree

Supervisor: Dr Mudavanhu A. Y

Year: 2021

Dedication

This research is dedicated to my parents, my beloved wife and to my lovely children for their warm kindness and spiritual prayer to me during my studies.

Acknowledgements

I would like to express my gratitude and give special thanks to my Project Supervisor Doctor Mudavanhu Aaron Young for his great commitment, consistent liberations and skilful guidance throughout the course of preparing this research project. It was through the effort of my supervisor who devoted his time to make possible for this document to be put together. I would also like to extent my remarkable thanks to Matabeleland Provincial Education Office, Binga District Education Office and to all school management for accepting my request to conduct a research to their schools in Binga District.

I also want to express my sincere gratitude to all Biology students and biology teachers in the selected Binga schools for their cooperation during the data collection period of my research. A special gratitude is also granted to my family members for their entire financial support and my fellow students who cooperated with me from the beginning of our study up to the date of submission of this research project. Finally I would also like to extent my special thanks and heartiest gratitude to the almighty God for guiding me through my academic progression up to this point. If it was not the grace and glory of the lord, my efforts could have been trembled into dust. In a nutshell, I say thank you lord for the countless blessings.

Abstract

The study sought to investigate the challenges faced by schools in the teaching and learning of Ordinary Level Biology in Binga District, Matabeleland North. The objectives of the study were to investigate the availability of human and physical infrastructure in schools (Siabuwa, Kalungwizi and Malube) for teaching and learning of biology, to find out the effect of large class size in teaching and learning of biology, to establish whether student's attitude towards biology affect teaching and learning and to recommend possible solutions to the challenges faced by school in teaching and learning of biology. The research was both quantitative and qualitative in nature where both questionnaires and focus group discussion were used as instruments to gather information. A sample of 30 biology students and 3 biology teachers was extracted from a study population of 120 subjects. Data was presented and analysed in the form of tables, pie charts and bar graph through the use of Microsoft Excel. The major findings of the study were that, there is critical shortage of biology teachers as well as infrastructure in Binga schools. There is also shortage of learning materials such as textbooks and biology apparatus for carrying out biology experiments. The large class size is also creating a host of class control problems and unbearable workloads for the biology teachers. The majority of students in Binga has negative attitude towards learning of biology. These conditions then compromise a meaningful teaching and learning of ordinary level biology. The conclusion and recommendations were also discussed. The researcher recommend that, schools should provide adequate learning equipment and the teacher pupil ratios experienced in schools need to be reduced in order to reduce the workload of biology teachers and also to ensure effective teaching and learning in schools.

TABLE OF CONTENTS

| | |
|------------------------|------|
| Dedication..... | i |
| Acknowledgements | ii |
| Abstract..... | iii |
| Contents page..... | iv |
| List of tables..... | viii |
| List of figures..... | ix |

CHAPTER 1: INTRODUCTION

| | |
|-------------------------------------|---|
| 1.1 Introduction to the study..... | 1 |
| 1.2 Background of the study..... | 1 |
| 1.3 Purpose of study..... | 3 |
| 1.4 Statement of the problem..... | 3 |
| 1.5 .1 Main research question..... | 3 |
| 1.5.2 Sub research questions..... | 3 |
| 1.6.1 Main Objective..... | 3 |
| 1.6.2 Research objectives..... | 4 |
| 1.7 Assumptions of the study..... | 4 |
| 1.8 Significance of the study..... | 4 |
| 1.9 Delimitations..... | 5 |
| 1.10 Limitations..... | 5 |
| 1.11 Definition of key terms..... | 5 |
| 1.12 Organisation of the study..... | 6 |
| 1.13 Chapter summary..... | 6 |

CHAPTER 2: REVIEW OF RELATED LITERATURE

| | |
|-----------------------|---|
| 2.1 Introduction..... | 7 |
|-----------------------|---|

| | |
|--|----|
| 2.2 Theoretical framework..... | 7 |
| 2.3 Challenges faced by schools in teaching and learning of biology..... | 8 |
| 2.4 Limited learning facilities and infrastructure..... | 8 |
| 2.5 Inadequate biology teachers or human resource..... | 9 |
| 2.6 Student’s attitude towards biology..... | 10 |
| 2.7 Large class size..... | 11 |
| 2.8 Possible solutions to the challenges faced by schools in teaching and learning of biology..... | 12 |
| 2.9 Research gap..... | 13 |
| 2.10 Chapter summary..... | 13 |

CHAPTER 3: RESEARCH METHODOLOGY

| | |
|--|----|
| 3.1 Introduction..... | 14 |
| 3.2 Research design..... | 14 |
| 3.2.1 Research approach..... | 14 |
| 3.2.2 Case Study research approach..... | 15 |
| 3.3 Population and sample..... | 16 |
| 3.3.1 Population..... | 16 |
| 3.3.2 Sample and sampling technique..... | 17 |
| 3.3.3 Data collection instruments..... | 17 |
| 3.3.4 Questionnaire..... | 18 |
| 3.3.6 Focus Group..... | 19 |
| 3.3.6 Data analysis methods..... | 19 |
| 3.4.1 Validity..... | 20 |
| 3.4.2 Reliability..... | 20 |
| 3.5 Ethical issues..... | 20 |
| 3.6 Chapter summary..... | 21 |

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

| | |
|--|----|
| 4.1 Introduction..... | 22 |
| 4.2 Response rate..... | 22 |
| 4.3 Challenges faced by students learning Biology in Binga..... | 22 |
| 4.3.1 The level of availability of human and physical infrastructure in schools..... | 23 |
| 4.3.1.1 Teacher’s views on the adequacy of learning facilities and infrastructure..... | 23 |

| | |
|--|----|
| 4.3.1.2 Student's views on the adequacy of learning facilities and infrastructure..... | 23 |
| 4.3.1.3 Teacher's view on the availability of human resource..... | 24 |
| 4.3.1.4 Student's views on the adequacy of human resource..... | 25 |
| 4.3.2 Student's attitude towards biology..... | 25 |
| 4.3.2.1 Teacher's views on student's attitude towards biology learning..... | 25 |
| 4.3.2.2 Student's attitude towards teaching and learning of biology..... | 26 |
| 4.3.3 The effect of large class in teaching and learning biology..... | 27 |
| 4.3.3.1 Teacher's views on the impact of large class size..... | 27 |
| 4.3.3.2 Student's views on the impact of large class size..... | 27 |
| 4.4 Possible solutions to the challenges faced by schools, teachers and students in teaching and learning biology..... | 28 |
| 4.4.1 Teacher's views on possible solutions to the challenges encountered in teaching and learning biology..... | 28 |
| 4.4.2 Student's views on possible solutions to the challenges encountered in teaching and learning biology..... | 29 |
| 4.4.3 Comparison of teachers and student's suggestions on how to improve teaching and learning of biology..... | 29 |
| 4.5 Chapter summary..... | 29 |

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

| | |
|---|----|
| 5.1 Introduction..... | 30 |
| 5.2 Summary of the study..... | 30 |
| 5.3 Conclusion..... | 31 |
| 5.4 Recommendations..... | 31 |
| 5.5 Recommendations for further research..... | 32 |

| | |
|---|----|
| REFERENCES..... | 33 |
| Appendix A student’s questionnaire..... | 36 |
| Appendix B Teacher’s questionnaire..... | 37 |
| Appendix C Focus group questions..... | 39 |
| Appendix D Authorisation letter..... | 40 |

LIST OF TABLE

| Table | Description | Page |
|--------------|---|-------------|
| 4.1 | Response rate | 22 |
| 4.2 | Teachers' views on the adequacy of learning facilities and infrastructure | 23 |
| 4.3 | Students' views on the adequacy of learning facilities and infrastructure | 23 |
| 4.4 | Students' attitude towards teaching and learning of biology | 26 |
| 4.5 | Teachers' views on impact of large class size | 27 |

LIST OF FIGURES

| Figures | Description | Page |
|----------------|---|-------------|
| 4.1 | Teachers' views on the availability of human resource | 24 |
| 4.2 | Teachers' views on students' attitude towards biology | 25 |
| 4.3 | Students' views on the impact of large class size | 27 |

CHAPTER 1: INTRODUCTION

1.1 Introduction to the study

This section focuses on the background of the study, purpose of the study, statement of the problem, main research question, research objectives and assumptions. It goes on to present the significance of the study, delimitations of the study, limitations, definition of terms as well as organisation of the study. The chapter ends with a summary which focuses on the details covered and points the way forward.

1.2 Background of the Study

In the year 2016 the government of Zimbabwe introduced Science, Technology, Engineering and Mathematics (STEM) with the aim of encouraging and improving the learning of science subjects which include Biology (Nhandara, 2016). Sciences are the most critical and essential subjects in every society as they influence the pace of development in a society (Wellington & Ireson, 2012). It is imperative and crucial to note that there is a significant skill shortage in Science, Technology, Engineering and Mathematics (STEM) related fields, not just in Zimbabwe, but on a global scale (Nhandara, 2016). Despite increased investment in education, there remains however significant lack of similarities between educational opportunities for Zimbabwe rural majority and those in urban, mission and former government schools (Chigwamba, 2012).

The Ordinary level examinations certificate constitutes a very significant future prospect of the learners (Ndlela, 2012). It is this certificate which determines who proceeds to Advanced level and who will join the tertiary institutions such as the colleges, universities, teacher training, nursing school and Zimbabwe Security Forces. Biology is an important subject as it enhances critical thinking, cultivating a passion for learning, uplifting many disciplines, upholding the key to the future and offerings numerous career opportunities. The majority of employers in Zimbabwe expect job seekers to have at least five Ordinary level passes including science. Science was also made compulsory in the curriculum of Zimbabwean schools (Chigwamba, 2012). This explains how important the subject is. In our march towards scientific and technological advancements, we need nothing short of good performance in science at all levels of schooling (Abraham & Reiss, 2012). Science is a fundamental part of human thought and logic, an integral to attempt an understanding of the world.

The government of Zimbabwe through the Education Transition Fund (ETF) supplied most schools with science and mathematics textbooks and other science learning equipment such that, there is a reasonable textbook to pupil ratio. Despite the government's effort, apparent usefulness of biology in life, importance and high esteem placed on learning biology, many people consider or find the subject difficult to comprehend. Recent examination statistics for Siabuwa cluster of schools in Binga show that many students did not fare well in Biology. The results provide an informed look at where more effort is needed in ensuring that Zimbabwe produces more Science, Technology, Engineering and Mathematics (STEM) graduates at college level. Biology as a learning area has been included in the curriculum of secondary schools in Siabuwa cluster of schools, Binga. The Siabuwa cluster of schools has five secondary schools which include: Siabuwa High, Kalungwizi Secondary, Malube Secondary, Sinampande Secondary and Sinanzengwe Secondary. Among these schools Siabuwa High is the largest one. Currently Siabuwa High School and its neighbouring schools are offering science subjects including biology at Ordinary level.

The other major reason that prompted the researcher for conducting the study is that, the government of Zimbabwe has identified the teaching and learning of science as a priority to the educational needs of the country (Chigwamba, 2012). From the previous researches, there were numerous factors that influence achievement in learning of Biology. Among other factors are pupil-teacher relationship and the school environment. The teacher's attitude and the teaching methods used also influences achievement in science (Orion & Hofstein, 1994). In spite of the brilliant idea of availing secondary education to all in Zimbabwe, the majority perceive science as a difficult learning area. The foregoing challenges encountered in teaching and learning of science particularly biology provided imperative impetus to embark on this study in Binga District secondary schools. The impetus was driven by the desire to find answers to the question: what are challenges faced by schools, teachers and students in teaching and learning of Biology. According to Binga District Result Analysis report (2019), Siabuwa cluster of Schools has produced very low pass rates in biology at ordinary level. Hence, this recurrence of very low pass rates in Biology at ordinary level at Siabuwa cluster of Schools has prompted the researcher to investigate the challenges faced by schools in the teaching and learning of Biology and also recommend possible solutions.

1.3 Purpose of study

The main purpose of this study was to investigate the challenges faced by schools, teachers and students in Binga district in teaching and learning of Biology and find out to what extent such challenges contributed to poor learning of biology and consequently poor performance in biology examinations.

1.4 Statement of the Problem

The study sought to investigate the challenges faced by schools in teaching and learning of Biology in Binga schools. Despite the significant role played by biology in enhancing understanding of other subjects such as Chemistry, Physics and Agriculture as well as its general role in life, the majority of learners will find the subject being difficult for them. In addition, the majority of the higher learning institutions in Zimbabwe require one to have a pass in three compulsory subjects which are Science, English and Mathematics in order to be enrolled for different programmes which are related to science. In spite of this, the teaching and learning of science in Binga schools seems to be encountered by several challenges. This has prompted the researcher to investigate the challenges faced by schools in teaching and learning of Biology at Ordinary level.

1.5.1 Main Research Question

This study aims to answer the question: What are the major challenges encountered by schools, teachers and students in the teaching and learning of Biology in Siabuwa cluster of schools, Binga.

1.5.2 Sub Research Questions

- (i) What is the level of availability of human and physical infrastructure in schools for teaching and learning of biology?
- (ii) How does student's attitude towards biology affect teaching and learning?
- (iii) What is the effect of large class size in teaching and learning of biology?
- (iv) What are the possible solutions to the challenges faced by schools in teaching and learning of biology?

1.6.1 Main Objective

The major objective of this study is to investigate the challenges faced by schools in teaching and learning of Ordinary level Biology.

1.6 Research objectives

- (i) Investigate the availability of human and physical infrastructure in schools (Siabuwa, Kalungwizi and Malube) for teaching and learning of Biology.
- (ii) To establish whether student's attitude towards biology affect teaching and learning.
- (iii) To find out the effect of large class size in teaching and learning of biology.
- (iv) To recommend possible solutions to the challenges on Biology teaching and learning.

1.7 Assumptions of the study

The researcher assumed that:

- (i) The sample of students and teachers to be used will be a true representation of students learning and teachers teaching Biology in Siabuwa cluster of schools.
- (ii) The respondents would provide honesty responses and to the best of their knowledge on interviews and questionnaires.
- (iii) All the Biology teachers follow the syllabus as stipulated by the Curriculum Development Unit (CDU) and in accordance to Ministry of Primary and Secondary Education expectations.

1.8 Significance of the Study

The study of challenges faced by schools in teaching and learning of Biology was definitely an aspect worth examining. The importance of this study emerges from the fact that if the challenges are revealed the project will provide the basis for solutions to these findings. The project would also provide insights on how to achieve better results and to give specific actions to be taken to efficiently and effectively address the challenges faced by schools in teaching and learning of science.

Furthermore, the project would provide some insights into the nature of challenges faced by the students in learning Biology. The study would not only assist the Department of education and the District involved (Binga) to improve its pass rate but would also provide strategies to guide schools to improve their Biology pass rate and also to lay a firm foundation for students to pursue further studies in Biology.

The project would also provide helpful information to the Ministry of Education on how to monitor school performance. Most importantly, it would bring to light some challenges faced by students and possible remedies would be provided. Not only the mentioned above would benefit even those who read and implement these strategies. However, despite benefiting others, the researcher would be the most beneficiary since he was directly involved in conducting the research.

Moreover, the evidence obtained should encourage and motivate policy makers and curriculum developers to improve the quality, relevance and attractiveness of Biology education so that it adapt to the learners' needs. The results would also give insight to parents and school authorities on how best to reduce failure rate, hence may acquire all necessary resources for the subject. Evidence obtained could be used to rekindle the learner interest in Biology as well as improving and increasing the pass rate.

1.9 Delimitations

The study was carried out in Binga district in Matabeleland North Province. The study was conducted amongst Ordinary level students in Binga South secondary schools. Views from Ordinary level students and teachers from selected Binga Secondary schools were sought in this research. Perceptions from other stakeholders, like, parents, heads of schools and other key stakeholders were outside the purview of this study. Issues relating to gender were not part of this study as the researcher believes that both the boys and girls have same attitude towards the subject. The researcher will focus on three schools in Binga for reasons that the schools are near the researcher, the researcher has limited resources to travel long distances to collect data and to buy stationary if large area was to be considered.

1.10 Limitations

The study was limited by the fact that only a small sample of three schools was used in the research and findings could not be generalised to the whole district. Since the focus of the study was on three schools, it limited the ability of the researcher to generalise the findings to a large population. Another limitation is that, the respondents might give false responses thereby affecting the validity of the findings.

1.11 Definition of key terms

Challenge: is defined as something difficult which requires great effort and determination.

Biology: is the natural science that focuses on the study of life and living organisms, including their physical structure, chemical structure as well as their functions.

Performance: According to Mutai (2010) performance is an accomplishment in particular subject area of a course, usually by reasons of skill, hard work or interest and attitudes. ZIMSEC defines performance as successfully attaining set cut-off marks examination of a subject whilst poor performance means attaining marks deemed to be far below a designed cut-off mark.

Achievement: Reach or attain a certain level, especially superior ability, special effort and great courage. For the purpose of this research achievement is the extent to which a student has achieved his or her educational goals. It could be very good, good or poor depending on a set pass mark. For instance grade C or better in biology is regarded as a very good achievement while grade D and below is a poor achievement in Zimbabwe Schools Examinations Council (ZIMSEC).

Attitude: Wasiche (2006) defines attitude as a feeling towards something which is sometimes reflected in a person's behaviour. As such attitude can be seen as an opinion or way of thinking, generalised feeling towards a particular object, subject or situation. It can also be defined as a perception that one forms towards an event, object or subject. Therefore it can either be favourable, neutral or unfavourable.

Day secondary school: Is an institution where pupils are given educational instruction during the day, after which the students return to their homes.

1.12 Organisation of the study

This study is organised into five chapters, with chapter one being the introduction which outlines the background of the study, the significance of the study and other important sub-headings. Chapter two will deal with the review of the related literature. The design of the study and methodology that was used in carrying out the study is outlined in chapter three. Chapter four comprises of presentation and analysis of data that was collected. Then chapter five is the summary of the findings based on the study objectives, conclusion, recommendations and suggestions for further research. References and appendices are presented at the end.

1.13 Chapter summary

The chapter discussed the background of the study, purpose of the study, statement of the problem, main research question, research objectives, assumptions and significance of the study. The geographical and conceptual delimitations of the study were also discussed. Limitations, definition of the terms and organisation of the study were discussed. The next chapter will actually make an attempt to unveil theories, methodologies and findings in literature relating to the study under investigation.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter, the researcher looked and dwelt on presenting the existing national, regional and international related literature in the arena of challenges faced by schools in teaching and learning of biology. This part begins with the exploration of the challenges faced by schools in teaching and learning of biology. This section of the study assists the researcher to establish gaps in literature. The major issues in study area by other scholars are also unveiled through this review. The chapter ends with a summary which focuses on the details covered and points the way forward.

2.1 Theoretical framework

This section presents the theories informing the study. Kerlinger (1986) defined a theory as a set of interrelated constructs, definition and propositions that present a systematic view of phenomena in a bid to explaining and predicting that phenomena. In context of the current study, the theoretical framework presents prior set of ideas explaining, decision, judgement and results of the challenges in the learning and teaching of biology.

Pedagogical Content Knowledge (PCK) Theory

This theory was first introduced by Shulman in 1987, which tried to explain the concepts within the educational system that dealt with teacher competency at the expense of content or knowledge of the learners. This theory was successful in presenting the foundations of “learning for understanding”, biology or science subjects (Berry et.al, 2008). Shulman identified three categories which shaped the Pedagogical Content Knowledge Theory which are as follows:

a) Subject matter knowledge

This sub-category exposes the understanding of subject matter knowledge falling on the teacher as a prerequisite in the assistance of learners to learn academic content. Feinman-Nemser & Parker (1990) further eluded the importance of subject matter knowledge when the teacher of biology seeks to foster conceptual understanding.

b. Curricular Knowledge

This includes the breadth and depth at which particular subject knowledge content covers. This includes the teacher's knowledge, in context to this research, the content of the teacher's knowledge about the different teaching programs, methods, strategies and aids in teaching biology, that are available to teach a particular topic. The teacher should be in the know, well informed of the availability of alternative instructional material such as biology textbooks, visual aids, laboratory demonstrations or computer software. The theory goes further to emphasize the importance of the teacher's knowledge about how the topics in biology links to previous topics taught, and still to be taught as well as how the topic integrates with other subjects (Shulman 1986).

c. **pedagogical content knowledge**

This sub category within the theory is a blend or intersection of subject matter knowledge and curricular knowledge which try to give an explanation of how particular topics, problems or issues are organised, presented and adopted to the diverse interest and abilities of learners for instruction. This sub category emphasizes the ability of the teacher to teach effectively if the teacher has the knowledge and understanding of:

- i) The learning difficulties of learners which may present themselves as challenges faced by schools in the learning of biology.
- ii) The pre-conceptions and misconceptions that learners may bring to the class about a particular topic and these misconceptions may present themselves as challenges faced by schools in the learning of biology.

2.2 Challenges faced by schools in the teaching and learning of biology

There are several challenges faced by schools in the teaching and learning of biology. Poor methods of teaching and lack of instructional materials are believed to be obstacles that hinder teaching and learning of biology in schools. The challenges faced by schools and reported in literature include limited learning facilities and infrastructure, inadequate teachers, student's negative attitude towards biology and large class size.

2.3 Limited learning facilities and infrastructure

The major reason that makes students to experience difficulties in learning biology is the limitations of learning facilities and infrastructure. The schools that do not have biology laboratories and only study biology by relying on theories do not carry out practical activities and experiments to improve the student's understanding, develop their skills in solving problems and understanding the nature of science to the concept of the topics presented by the

teacher (Bahar et.al, 1999). Biology learning may then be delivered as teacher-centred, causing students to become bored in learning biology and less interested in learning more deeply. Owing to inadequate infrastructure, the learning delivered by the teacher only pursues the material demanded by the examinations so that, it is lacking in conducting experimental activities that please students (Cimer, 2012). A condition like this will eventually cause academic atmosphere in biology learning activities become not conducive to carrying out optimal learning activities. The students may not focus on learning biology, playing around when learning activities are taking place. This situation makes it difficult for teachers to conduct classroom management activities (Cimer, 2012).

Furthermore, there are studies suggesting that students in schools with poor infrastructure can have lower scores than those with access to better infrastructure facilities for example science laboratories, library and the learning classrooms. This makes school infrastructure a key element in student's academic as well as holistic growth. The key components which should feature in any school infrastructure include: spacious and well-ventilated classrooms, libraries, well equipped labs and well- maintained sanitation facilities (UNESCO, 2006). Poor school infrastructure had a negative impact in learning among students. The schools with science laboratories fully equipped and suitably designed for various subjects such as chemistry, physics, biology or home science are likely to motivate learners. In line with this, Gewirtz (2000) argues that, teachers in schools with insufficient resource in England pay attention to examinable subject. The teachers prefer to use lecture method and not engaging into the child centred methods due to shortage of resources. Quality education can only be available when learning environments have enough resources and facilities (UNESCO, 2006). Sciences are practical subjects and this implies that, the scientific reality should be discovered through observations and experiments. Adequate facilities and infrastructure will enable students to develop problem solving skills. Hence, this study sought to investigate the level of availability of learning facilities and infrastructure for effective teaching and learning of biology.

2.4 Inadequate biology teachers or human resource

The shortage of qualified science teachers is a worldwide problem. Many countries in the world are threatened by shortage of teachers. UNESCO (2006) reported that, the world is facing a shortage of qualified teachers. Ingersoll (2003) reported on the shortage of teachers to such an extent that, too many students are being taught by teachers who lack subject matter knowledge, training and instructional skills which are necessary to assist students learn especially in science subjects in Washington. Lauder (2009) revealed that, the largest survey of Australia teachers

and school principal revealed that teacher shortage was so bad that about forty-three percent of secondary school principals had to ask teachers to take classes that they were not qualified to teach

Furthermore, UNESCO (2006) reported on the issue of teacher shortage that some countries face particular challenges. The number of teachers per subject in most public secondary schools is small to allow proper teaching. The shortage of teachers is having a negative impact on the efforts and attempts to improve the quality of education in schools. In addition, inappropriate training background of teacher and qualification of biology teachers are also the major factor which is a stumbling block against effective teaching of biology (Ingersoll, 2003). This is owing to the fact that, biology teachers in some secondary schools did not undergo and get enough training to enable them acquire skill, qualities and enough knowledge of the subject matter and how to impart the knowledge to the learners. It is vital to have specialist biology teachers to ensure effective teaching and learning in biology as general performance of students in any subject may be attributed to teacher qualification and training in the subject. Therefore, this study seeks to investigate the extent to which, shortage of qualified biology teachers affects teaching and learning of biology in schools.

2.5 Student's attitude towards biology

Attitude plays a crucial role towards the future of science students. The student's attitude towards science affects their science academic performance (Prokop et.al, 2007). The study of biology is vital towards the success of students. Biology as a discipline tends to study all living things and their interactions in the biosphere. As a science subject, biology helps students to develop such practical skills in experimental work such as observation, accurate recording, logical reasoning and effective manipulation of experiments (Prokop et.al, 2007). Attitude could be positive, negative or neutral. Attitude can be a method, disposition, feeling or condition in respect of an individual or object, particularly of the mind (Khan & Ali, 2012). It is important for science teachers to ensure that students have positive attitude in science subjects. However, studies shows that the way students are taught in science classrooms is not interesting to them.

In a bid to enhance student's achievement, it is important for the teachers to identify what type of attitudes students have so as to assist them in a certain discipline. Different studies show the outcome on student's attitudes towards learning science and biology in particular. Usak et.al (2009) has found out that, student's attitude towards biology is neutral; he concluded that

improving their interest in studying biology will lead to better learning outcome in biology. Contrary to this, gender difference was found between student's attitudes towards studying science. Boys show more positive attitudes than girls-students (Nasr & Soltani, 2011). In another study conducted by Prokop et.al (2007), they found boys to have more interest towards biology than girls. The student's attitude towards learning affects their achievement. If attitudes are positive, students tend to have a better learning outcome. Teacher's attitude towards the teaching of biology may also be a challenge to effective teaching and learning process.

The teacher's personalities such as the way the teacher talks, reacts to issues, code of conduct and dress code has become the major factors which leads to the ineffective teaching of biology (Usak *et.al*, 2009). A teacher, who has a negative attitude towards biology, may influence biology learners that biology is a challenging subject thus causing learners to hate the subject. Researches that have been conducted to determine the attitude of students towards biology revealed that students generally have negative attitudes towards the subject. They are however some studies which shows that students have a relatively positive attitude towards biology. Therefore, this research seeks to investigate the nature of student's attitude towards biology learning.

2.6 Large class sizes

Overcrowded or large classes are a common problem in most developing countries including Zimbabwe. When class sizes are large, students are not really involved in teaching and learning. Amua-Sekyi (2010) argues that quality teaching and assessment actually suffer in large classes and this is an indictment on the quality of higher education in Ghana and other developing countries. The developing of appropriate teaching and learning styles in large classes with diverse needs are a challenge in the teaching and learning of science. ATL (2009) portrays that, large class sizes had an impact on student's concentration and participation. These imply that large class size really impacts negatively on student's academic achievements and their quality of learning.

The large class size is not conducive for serious academic work. An alarming large class size of more than fifty students in the secondary schools leaves the teachers overworked and therefore unable to exercise patience and positive attitude (Benbow et.al, 2007). The teachers are also reluctant to offer extra time to rebuild and assist the intellectually ill students. Nyambura (2004) argues that small class size makes the teachers work less strenuous and effective as opposed to large class size which may limit the teacher's ability to cater for

individual differences as well as proper class management. The teacher-pupil ratio cannot be overestimated and underrated but it is of great importance in the teaching and learning process. The low ratios imply that more attention and time is given to students and this gives teachers more time to attend to individual challenges. Messages emerging from literature cited suggest that large class impact negatively on teaching and learning. Hence this research wishes to investigate whether class size could have a bearing in the challenges faced by schools in teaching and learning of biology.

2.7 Possible solutions to the challenges faced by schools in teaching and learning of biology

The provision of adequate teaching and learning aids makes learners to like biology. Therefore, there is need for the provision of adequate teaching aids so as to develop positive attitude towards biology in the students. The practical work in biology is interesting and makes students to like biology; therefore teachers should provide enough specimens to generate positive attitudes in biology learning (Nasr & Soltani, 2011). Wellington & Ireson (2012) point out that the use of Information, Communication and Technology (ICT) as alternative to the laboratory-based work can help students in understanding the theoretical work. The ICT enhances the quality of teaching and learning science.

Provision of adequate qualified teachers is another possible solution that can be implemented to solve the challenges faced by schools in the teaching and learning of science. The government should recruit more qualified science teachers to improve the teaching and learning of biology. Students taught by teachers with degrees in biology had greater gains in achievement than students taught by teachers with non-biology degree. UNESCO (2006) reports that developing positive attitude, motivation and proper guidance of students, provision of relevant teaching materials, additional classrooms and furniture, provision of libraries and laboratories were some of the ways of improving teaching and learning in biology.

Studies investigating challenges faced by schools in teaching and learning of biology have been reported elsewhere but not in Binga. It should however be appreciated to this end that, ways suggested above may be applicable in western nations and other developed nations in Africa only which might not necessarily work in Zimbabwe and specifically in Binga. Therefore, this study attempts to find ways that can improve teaching and learning of biology.

2.8 Research gap

The challenges required in-depth investigation to enlighten the challenges faced by schools in the teaching and learning of biology. The researcher considered inadequate human resource,

large class sizes, student's attitude towards science and the availability of learning facilities and infrastructure to have a great influence in the whole process of teaching and learning. The studies conducted were not in Binga district and most of them were not in secondary education but primary education. Those researches had put much attention in other factors such as teaching methods, lack of teaching material and poor teaching environment. Furthermore, the sample suggested in this research could differ from other studies as the researchers involved biology teachers and ordinary level biology students.

2.9 Summary

The chapter has shown challenges faced by schools in the teaching and learning of biology at ordinary level. It highlighted how inadequate physical infrastructure, inadequate human resource, student's attitude towards science and large class size affects teaching and learning. The chapter also revealed the possible solutions to the challenges faced by schools in the teaching and learning of biology. Lastly, the research gap was identified whereby the researcher wanted to investigate challenges faced by schools in the teaching and learning of biology. The next chapter is devoted to the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the strategies and procedures that were used to collect and analyse data. This section of the study, essentially dealt with the procedures the researcher carried out in investigating the challenges faced by schools in teaching and learning of biology. The research methodology chapter discusses the research design (research paradigm, research approach and research strategy), sources of data, the case study site and population, the sample size and sampling technique, the procedures of data collection (or the data gathering tools), the methods of data analysis by which knowledge is gained giving the work plan of the research. This section of the study also looked at reliability, validity and ethical issues. It ends with a chapter summary.

3.2 Research Design

Tuckett (2004) defines research design as a structure to answer mere research questions and close the gaps of previous literature sources. Creswell (2014) viewed a research design as a well-organized step used to fulfil the purpose of the study. Creswell (2014) goes on to say that the research design reduces the chance of collecting haphazard data and ensures that data collection fits into the objectives of the research. A research design describes the plan for selecting the subjects, research sites data collection methods, data analysis methods and how the data is to be presented to answer research questions (Cohen, 2008). Its major and ultimate purpose is to provide results that are judged to be credible. With reference to the purpose of the study which is to investigate the challenges faced by schools in teaching and learning of biology, a mixed method research approach and a case study will be followed. The research approach necessitated data gathering from biology learners and educators who directly experience the effect of the teaching and learning process so that more effective insights into the challenges faced by schools in teaching and learning of biology could be unveiled.

3.2.1 Research approach

The study adopted a mixed method approach which is a method for conducting research that involves collecting, analysing and integrating quantitative and qualitative data (Creswell, 2014). Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems that either approach cannot provide on its own. Therefore, mixed methods research represents research that involves collecting, analysing and interpreting quantitative and qualitative data in either a single study or in a series of studies that investigate the same underlying phenomenon.

The quantitative paradigm is based on positivism while the qualitative paradigm is based on constructivism (Altheide & Johnson, 1994). Quantitative research is a type of research in which the researcher decides what to study, asks specific narrow questions, collects quantifiable data from participants, analyses these numbers using statistics and conducts the inquiry in an unbiased objective manner (Morgan, 2018). Qualitative research is a type of research in which the researcher relies on the views of participants, asks broad general questions, collecting data consisting largely of words from participants, describes and analyses these words for themes and conducts the inquiry in biased subjective manner (Morgan, 2018). Mixed methods research offers great promise for practicing, researchers who would like to see methodologists describe and develop techniques that are closer to what researcher actually use in practice. Pragmatism research as the third research paradigm can also help bridge the schism between quantitative (scientific) and qualitative (interpretive) research. Many research questions and combinations of questions are best and most full answered through mixed research solutions (Mertens, 2003). The aim here was to gain in breadth and depth of understanding and corroboration, while offsetting the weaknesses inherent to using each approach by itself. This approach offers the benefit of possibility of triangulation which allowed the researcher to identify aspects of a phenomenon more accurately by approaching it from different points using different methods and techniques. The use of this approach was necessitated by the need to look at the research question from different angles, and clarify unexpected findings and potential contradictions (Mertens, 2003). There was also need to elaborate, clarify and build on findings from other methods. Creswell (2014) posits that this approach provides a more complete and comprehensive understanding of the research problem than either qualitative or quantitative approaches alone. Therefore, in this study the researcher has opted to use mixed approach because of several advantages that it offer.

3.2.2 Case Study Research Strategy

Case study

Case study research strategy involves a detailed and intensive analysis of a particular event, situation, organization or social unit. A case study is best conceptualized by the bounded phenomena of interest and not by specific methods, thus different studies can be conducted under this broad umbrella (Thomas, 2011). Case study research offers benefits in terms of process and outcome. The case study design will help one to focus the research within the confines of space and time on a specific case. A case study also gives an opportunity to collect different kinds of data such as interviews, documents, observations, surveys and others about the case and provides with the chance to get an in-depth look at an organization or individual and the inner workings and interactions of that organization or individual (Thomas, 2011).

A case study is an in-depth investigation of a contemporary phenomenon within its real-life context (Yin, 2018). A case study also refers to a depiction either of a phase or the totality of some selected datum (Thomas, 2011). In a case study research the focus is on an in-depth study of one or a limited number of cases. In practice, however its use is rather messier and more complex (Gillham, 2000). Case study research also focuses on a specific event, person, place, thing or even an organization. The key goal of the case study is to identify the case and the boundaries of that case. The other purpose of a case study is to help in bringing the understanding of a complex issue or object. It can extend experience or add strength to the existing knowledge through previous research. The study used a case study. The choice of the case study allowed the researcher to probe deeply and analyse intensively challenges faced by Binga schools in the teaching and learning of biology. The study engaged in an in-depth study of teachers and learners views on the teaching and learning of biology. Furthermore, the choice of the case study has been necessitated by its convenience and cost cutting ability.

3.3 Population and Sample

The population includes all objects of interest whereas the sample is only a portion of the population. The population of interest in this study is defined below as well as the corresponding sample and sampling techniques.

3.3.1 Population

This study was conducted in secondary schools of Binga District. This is one of the eight districts in Matabeleland North Province of Zimbabwe. There are five secondary schools in Siabuwa cluster of schools. The target population comprised of these five secondary schools. They are four biology teachers and 120 ordinary level students in the three secondary schools of interest. Of the 120 form four students 75 are boys whilst 45 are girls. The choice of the

district and the three schools was because of familiarity of the locality to the researcher. This made it easier to establish a rapport with the respondents hence making data collection effective. Accessibility to majority of the schools sampled was also considered by the researcher.

3.3.2 Sample and sampling technique

A sample is a part of the target population carefully chosen or selected to represent that population (Copper, 2003). They are three secondary schools in Siabuwa cluster of schools, four biology teachers and 120 Ordinary Level students. Of the 120 form four students 75 are boys whilst 45 are girls. The sample comprised of all Ordinary Level Biology teachers (3 teachers) and selected 30 students studying biology. The research has a sample size of at least 28% of the population which according to Nkpa & Gorad (cited in Mutai 2010) is acceptable since a sample of 20-30% of the population is acceptable. Bailey (1978) portrays that more weight to the findings is obtained as a result of studying the entire population. However, it will be difficult to carry out research on every student given short time frame and high cost associated, thus as a sample size was used to represent the entire population.

The main advantage of sampling is that it provides a range of methods that enable one to reduce the amount of data one needs to collect by considering only data from sub-group rather than all possible cases or elements (Copper, 2003). The researcher employed stratified random sampling in the study. Stratified sampling is a type of sampling method in which the total population is divided into smaller groups or strata to complete the sampling process (Sarndal, 2003). Every element in the population must be assigned to one and only one stratum. Then simple random sampling is applied with each stratum. The objective is to improve the precision of the sample by reducing sampling error (Sarndal, 2003). At each school, the names of pupils were put in two separate boxes, one for females and the other for males. The names were then picked at random. Twelve (12) females and eighteen (18) males were selected for the questionnaires. This method was useful in ensuring gender balance. The researcher used this technique owing to the fact that it reduces bias on part of the research at the sampling stage and also the analysis stage.

3.3.3 Data collection instruments

In this study, the researcher opted for the questionnaire and focus group because they complement each other and to cover up for the short comings of using one method. Therefore,

the use of triangulation which uses two or more methods of data collection in the study helped to complement one method's short comings (Cohen & Marion, 2007). The quantitative data was gathered using the questionnaires and the qualitative data were gathered using focus group discussions.

3.3.4 Questionnaire

Questionnaires were developed as main instrument of data collection from the respondents. A questionnaire can be defined as written forms that ask exact questions of all individuals in the sample group, and which respondents can answer at their own convenience (Gall & Borg, 2007). The questionnaire is the most widely used type of instrument used in most educational researches. The data provided by the questionnaires can be more easily, accurately analysed and interpreted than the data obtained from verbal responses. Questionnaires provide greater uniformity across measurement situations than do interviews. Each person responds to exactly the same questions because standard instructions are given to the respondents. Hence, questionnaires are believed to be best in getting large amount of data from large number of respondents in a relatively shorter time with minimum cost.

Biology Teachers Questionnaires was used to obtain data from biology teachers in secondary schools. The data was consequently used to identify the challenges faced by schools in the teaching and learning of biology. The purpose of this questionnaire was to investigate the challenges faced by biology teachers in teaching biology. The Biology Student Questionnaire was also used to obtain data from biology students in secondary schools. The data was also consequently used to identify the challenges faced by learners in the learning of biology. This questionnaire was administered to randomly selected Form Four students in the selected secondary schools.

3.3.5 Focus group

A focus group is defined as special type of group in terms of purpose, size, composition and procedures (Kruger & Casey, 2000). Traditionally the focus group was used in social science research, the purpose of the group is to bring people together, in order to listen, and capture their attitudes, experiences or perspectives on a focused topic. The focus group allows the researcher to gain access around a topic which is under investigation. The researcher benefited from group dynamic brought by focus group discussion which is absent in individual interview. Furthermore, as postulated by George (2013), focus group discussion is the social interaction in focus groups that create synergies; encouraging participants to act in ways they would not

do in an interview. This actually enabled the researcher to analyse how participant's views are constructed, expressed, defended or even modified within the context of the discussion. The discussion also empowered participants to discuss what they feel is important, and in doing so, were able to use their language, and express their world views freely. The researcher tried to ensure a supportive and non-threatening atmosphere by informing participants that different perspectives are expected and welcomed, and that there are no right or wrong answers to be assessed by the researcher. The Focus group discussion was useful in generating a rich understanding of participant's experiences and beliefs and also gathering of the data (Gorge, 2013). For ethical reasons the focus group participants were coded as follows: Students in focus group one (FG1), students in focus group two (FG2), students in focus group three (FG3) and students in focus group four (FG4).

3.3.6 Data analysis methods

The data was analysed both quantitatively and qualitatively. Qualitative data was obtained from the open-ended items in both the students and teacher questionnaires and focus group discussions. The analysis of the data was based on the responses collected through questionnaires and focus group. Quantitative data was obtained from closed ended items in the student and teacher instruments. The data gathered was presented with the aid of tables and graphs. The pie charts were also used to analyse the background information of the respondents. The qualitative analysis was done as follows: initially, transcribing and coding the data to make the analysis easy; secondly organising and noting down of the different categories were made to assess what types of themes emerged with reference to the research questions. Then finally, the findings from quantitative and qualitative data were compared.

3.4.1 Validity

Checking the validity and reliability of data collecting instruments before providing to the actual study subject is important to assure the quality of the data (Yalew, 1998). The researcher was concerned with the degree to which Biology teacher's questionnaire and Biology student's questionnaire were able to unveil the challenges faced by schools in the teaching and learning of biology. To ensure validity of the instruments, firstly the instrument was prepared by the researcher and developed under close guidance of advisor, who was involved in providing inputs for validity of the instruments.

3.4.2 Reliability

Data collection instruments were pilot tested at Tyunga Secondary school, a school which is outside Siabuwa area to test the validity and reliability of the instruments. The purpose of the pilot study is to ensure that the instrument will test and measure what they are supposing to. The adjustments were then made before the final distribution of the questionnaires to the actual respondents. This actually assisted the researcher to refine data collection plans with respect to both the content of the data and procedures to be followed. Pre-testing the instrument enabled the implementation of some changes in questions that sounded ambiguous in the guide.

The respondents of the pilot test were not included in the main study. The pilot study actually helped the researcher to develop the necessary experience in using the instruments before the main study. The pilot study helped locate ambiguities, reveal flaws in the questions and inadequacies in the coding system. This in turn led to evaluation and improvement of the questionnaires. Based on respondent's response additions, omission and modification of question were undertaken.

3.5 Ethical issues

The researcher sought permission from the responsible authority to use the school's staff, students, as well as the research site, that is; regional office, district office and the school heads. The questionnaire was sent out with a cover letter explaining the purpose of the research in more detail. The participants maintained complete anonymity in the study. The participants were not required to put their name on the survey to assure the anonymity of the participants. The data and surveys were stored in the home of the researcher.

The researcher informed the respondents about the purpose of the study that is, purely for academic purposes; the purpose of the study was also introduced in the introduction part of the questionnaires to the respondents and confirms that subject's confidentiality was protected. In addition to this, they were informed that their participation in the study was based on their consent. The research did not personalise any of the respondent's response during data presentations, analysis and interpretation. Furthermore, all the materials used for this research was acknowledged.

3.6 Chapter summary

This chapter discussed the methodology used to gather data for the purpose of this study. Mixed method approach was adopted with the sequential explanatory design employed in conducting

the study. Since the mixed approach was employed both quantitative and qualitative data gathering techniques were used and as such questionnaires and focus group interview were the data collection techniques. The population, sample and sampling technique were described. Validity and reliability were also taken into consideration. The research was conducted with all due ethical considerations. The next chapter is devoted to presentation and analysis of data collected using methodology discussed above.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the data gathered from questionnaires and focus group discussions which the researcher used to gather information. The study was conducted with the aim to investigate the challenges faced by schools in teaching and learning of biology at ordinary level. The population for this study was 120 students with 3 teachers from three selected schools. About 33 questionnaires were distributed and there was 100% response rate. The focus group discussions were conducted to validate and complement the response from the questionnaires. The data gathered were presented and analysed using tables, pie charts and bar chart. Quantitative and qualitative data were presented and analysed under the following themes: the level of availability of human and physical infrastructure in schools, student's attitude towards biology teaching and learning, effect of large class sizes on teaching and learning biology, and possible solutions to the challenges.

4.2 Response rate

The questionnaires were used in gathering data. Thirty (30) student questionnaires were distributed to the selected schools and about three (3) teachers' questionnaire were also distributed to the selected schools. The overall actual response rate was 100%. Therefore, the high questionnaire response rate of 100% attained by this research is valid for making conclusions on the schools under study.

Table 4.1: The number of targeted responses in the study and the actual number of respondents.

| Item description | Target | Actual | Response rate in percentage |
|------------------|--------|--------|-----------------------------|
| Students | 30 | 30 | 100% |
| Teachers | 3 | 3 | 100% |
| Total | 33 | 33 | 100% |

4.3 Challenges faced by students learning Biology in Binga

In a bid to validate the data gathered from quantitative findings, the qualitative data was gathered through focus group discussions. The data obtained from the focus group discussion was presented using verbatim, recorded and transcribed. The content analysis was then done.

4.3.1 The level of availability of human and physical infrastructure in schools

4.3.1.1 Teachers' views on the adequacy of learning facilities and infrastructure

Table 4.2: Teachers' views on adequacy of learning facilities and infrastructure

| Facility | Adequate | Inadequate | Not available |
|------------|----------|------------|---------------|
| Apparatus | 0 | 3 | 0 |
| Laboratory | 0 | 1 | 2 |

The findings from table 4.2 revealed that some schools had inadequate learning facilities like apparatus (100% inadequate) and laboratories (66.6% inadequate). The findings from the study agrees with that of Yadar (2001) who revealed that no course in science and mathematics can be considered as complete without including some practical work. The learners tend to comprehend and recall what they did practically than what they hear, but however schools lack functional science laboratories. The shortage of learning facilities and infrastructure such as apparatus and laboratories meant that most of the science concepts were taught theoretically, thereby depriving students of their development of being manipulative and execution of other scientific process such as observing, measuring, recording, handling apparatus, interpreting data, drawing conclusions and reporting findings. Availability of learning equipment and infrastructure is the hallmark in teaching and learning of science. Therefore, the inadequacy of science equipment and consumables makes science teaching and learning ineffective in school.

4.3.1.2 Students' views on the adequacy of learning facilities and infrastructure

The information regarding infrastructure in the school was also sought from the students.

Table 4.3: Students' views on the adequacy of learning facilities and infrastructure

| Item description | Available | | Not available | |
|---|-----------|-------|---------------|-------|
| | frequency | % | frequency | % |
| Science laboratory | 10 | 33.3% | 20 | 66.7% |
| Adequate equipment for learning biology | 4 | 13.3% | 26 | 86.7% |

The findings from the table above revealed that the basic facilities to enhance learning are inadequate. The availability of facilities such as laboratory and learning materials are important for the student because when they are adequate student feels more comfortable to learn. The

study on infrastructure agrees with that of Kinder (2003) who revealed that when basic infrastructure are available, students get attracted and motivated to learn and this will contribute to good academic performance of the students.

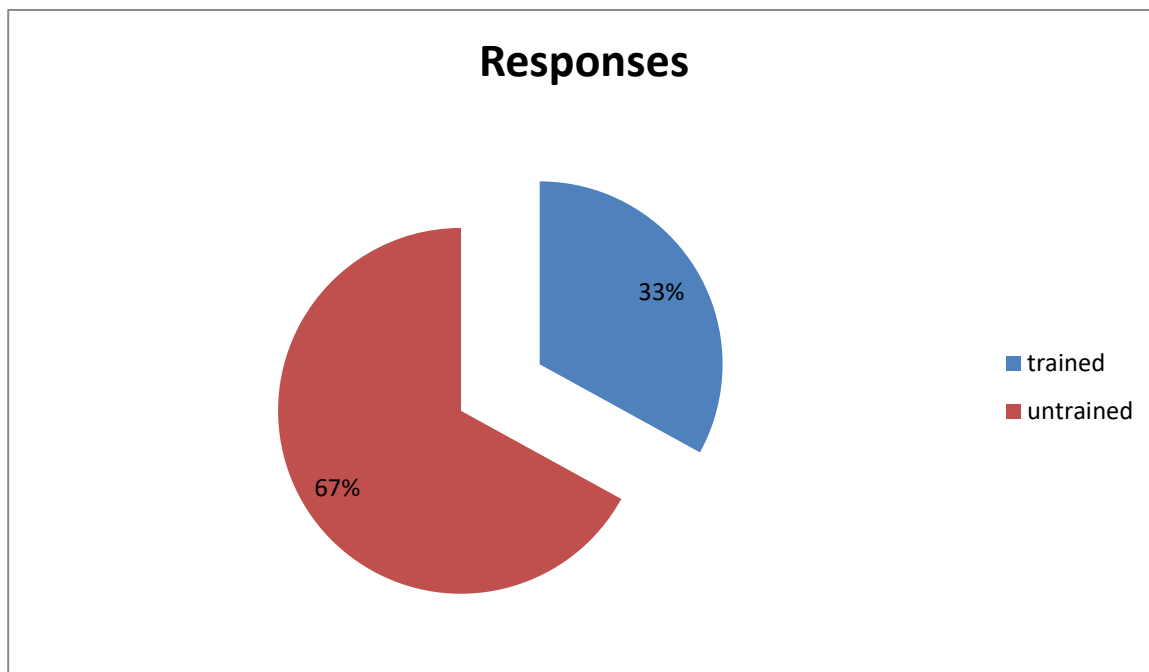
The results from focus group discussions revealed that there are few biology textbooks especially those of the new Curriculum Framework 2015-2022. An average of 10 students shares one textbook. The results have also revealed that, the schools are lacking proper infrastructure such as the laboratory and the learning equipment like the apparatus which are required for carrying out biology practical. The results are consistent with Masau (2004) who revealed that lack of learning facilities was one of the major challenges standing in the way of achieving high education standards in schools. The findings about lack of adequate infrastructure is in line with Kinder (2003) who revealed that when basic infrastructure are available, students get attracted and motivated to learn and this will contribute to good academic performance of learners.

4.3.1.3 Teachers' views on the availability of human resource

The information regarding the availability of biology teachers was sought from the teachers.

The findings are shown in fig 4.1 below

Fig 4.1: Qualifications of teachers



The findings revealed that there is critical shortage of biology teachers in Binga. About 67% of the teachers who are teaching biology are not trained to teach it and only about 33% are trained to teach biology. Lack of sufficient, qualified teachers and staff instability threaten

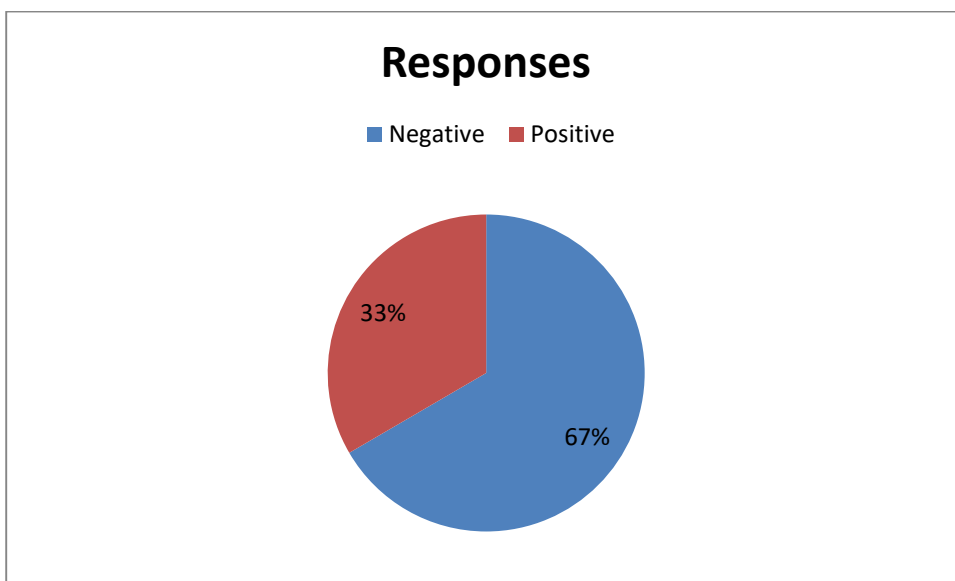
student's ability to learn and also reduces the teacher's effectiveness. A shortage of teachers harms students, teachers and the public education system as a whole. This is in line with Ingersoll (2001) who revealed that the teacher shortage makes it more difficult to build a solid reputation for teaching and to professionalise it, which further contributes to perpetuating the shortage.

Furthermore, the critical shortage of biology teacher in Matabeleland North and specifically in Binga has affected the education system's goal of providing quality and sound education equitably to all children. Therefore, teacher shortages and turnover are among the most critical issues in Binga schools. Teachers are the number one in-school influence on student's achievement and researches show that poor quality teaching disrupts learning and has a negative impact on the student's ability to achieve learning goals (Clark et.al, 2017).

4.3.2 Students' attitude towards biology

4.3.2.1 Teachers' views on the student's attitude towards biology teaching and learning

Fig 4.2: Teacher's views on student's attitude towards biology



It has emerged from the study that 67% of the students had a negative attitude towards biology and only 33% considered to have positive attitude. The teachers have indicated that their students had negative attitude towards biology. This is in line with Obodo (2012) who revealed that, if students have a positive attitude will definitely be interested in the learning of a study area. Therefore, it can be concluded that students who develop negative attitude at school are more likely to perform badly.

4.3.2.2: Students attitude towards teaching and learning of biology

The study further sought to identify the opinions of students towards learning of biology. This assisted in detecting the kind of attitudes they had formed towards the subject. The responses from the learners were put under five categories of a five-point likert-scale which included: Strongly agree, agree, unsure, disagree and strongly disagree

Table 4.4 below shows student's perceptions about biology and biology learning

| Category | SA | | A | | U | | D | | SD | |
|--|------|-------|------|-------|------|-------|------|-------|------|-----|
| | freq | % | freq | % | freq | % | freq | % | freq | % |
| Biology is difficult for me | 6 | 20% | 6 | 20% | 3 | 10% | 6 | 20% | 9 | 30% |
| There are too many facts to learn in biology | 7 | 23.3% | 11 | 36.7% | 5 | 16.7% | 4 | 13.3% | 3 | 10% |
| I am sure I can learn biology | 8 | 26.7% | 5 | 16.7% | 9 | 30% | 2 | 6.7% | 6 | 20% |

It can be seen from the table 4.6 above that students in the three schools have positive attitude towards biology as indicated by 50% (15) agreement by students that biology is not difficult for them from question 1. It has been also noted that about 60% of the learners view biology as a complex and abstract subject. This has revealed on question 2 where the majority of students indicated that, there are too many facts to learn in biology. As such students have a negative view about the subject when it comes to difficulty but the data gathered revealed that they are willing to learn. Therefore, it can be noted that the difficulty of the subject was raised as the major cause of learners developing negative attitude while some argue that, there are too many facts to learn in biology. A greater number of students in Binga secondary schools lack self confidence and esteem in their ability to learn science subjects as indicated in Table 4.6 where over 50% (17 students) revealed that they cannot learn biology.

4.3.3 The effect of large classes in teaching and learning biology

4.3.3.1 Teachers' views on impact of large class size

Table 4.5 below shows responses from the teachers on large class size

| Item | Effects of large class size in teaching and learning | Yes | % | No | % |
|------|---|-----|-----|----|-----|
| 1 | Large classes affect teaching and learning of biology | 3 | 100 | 0 | 0 |
| 2 | Poor classroom management | 3 | 100 | 0 | 0 |
| 3 | Is there any convenience in teaching biology in a large class | 0 | 0 | 3 | 100 |

The findings revealed that 100% of the teachers agreed that large class size leads to poor classroom management, ineffective student's control, poor planning and assessment and increase strain on teachers. These responses indicate that large class size has negative implications on effective teaching and learning of biology. The class size is thought to influence teaching and learning. The study has also revealed that large class size affects the academic achievement of students in secondary schools. The large teacher-pupil ratios create a host of class control problems and unbearable workloads for the teachers. This condition therefore compromises a meaningful learning resulting in posing challenges to teaching and learning of biology in schools.

4.3.3.2 Students' views on the impact of large class size

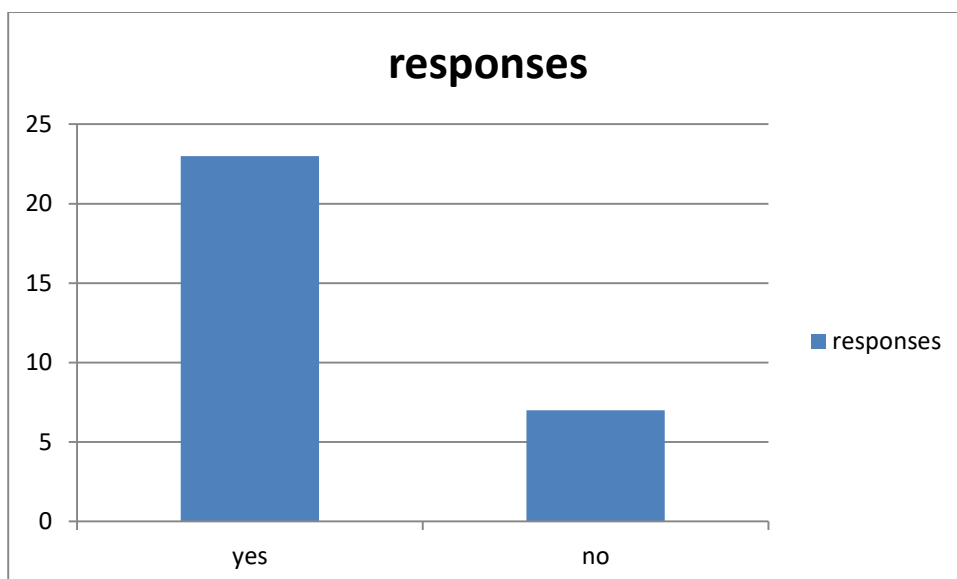


Fig 4.3: Student's views on whether large class size negatively affects biology teaching and learning

The findings from students on large class size revealed that it is difficult for students to participate in a large class. The study revealed that about 23 students (76.7%) indicated that it is difficult for them to participate in a large class and only 7 students (23.3%) indicated that, they can participate well in a large class. Large classroom results in less individualised attention from the teacher. More often than not large classrooms lend themselves to a more disruptive environment because there are more students to manage. Furthermore, larger classrooms mean less participation by students in group discussions. Participation in class is an important aspect of student learning. This is because if students speak up in class they learn to express their ideas in a way that others can understand. Through asking questions, they learn how to obtain information to enhance their own understanding of a concept learnt. Therefore, this condition compromises learning of biology as a science subject that require the teachers to give more attention to the individual learners.

4.4 Possible solutions to the challenges faced by schools, teachers and students in teaching and learning biology

4.2.1.1 Teacher's views on possible solutions to the challenges encountered in teaching and learning biology

The participants were asked through an open-ended question which gave the teachers room to express their views on how to improve the teaching and learning of biology. Almost 100% of the respondents that is teachers suggested that provision of adequate biology textbooks would improve the teaching and learning of the subject. All teachers suggested that provision of enough textbooks would ensure quality education and also improves understanding of the concepts by the students as they will be having opportunity to read on their own.

Two of the teachers bemoaned that lack of learning facilities and infrastructure was a major stumbling block to effective teaching and learning of biology. Shortage of the apparatus to carryout biology practical was identified as the major challenge by both teachers and the students. However, the teachers suggested using improvisation as a solution to improve the teaching and learning of biology. Improvisation is done when apparatus and equipment are inadequate or not available. The teachers also noted that improvisation will help learners to grasp concepts better as locally available materials will be used. This finding is in line with Bhukuvhani et.al (2010) who revealed that improvisation enables the learners to gain

experience in the use and control of apparatus and instruments without the necessity of having the equipment.

4.4.1.2 Students' views on possible solutions to the challenges encountered in teaching and learning biology

The participants were asked through an open ended question to express their views on how to improve teaching and learning of biology. Almost 100% of the respondents, the students suggested that, provision of adequate biology textbooks and other biology learning equipment such as the apparatus for carrying out experiments would improve the teaching and learning of the subject.

4.4.1.3 Comparison of teachers' and students' suggestions on how to improve teaching and learning of biology

The participants, both the teachers and the students have suggested that provision of adequate biology textbooks and other biology learning equipment would go a long way in teaching and learning of biology. The teachers and students have also suggested that provision of proper learning facilities and infrastructure would improve the learning of the subject. For effective learning, teacher- pupil ratio should also be reduced. Reducing class sizes is another solution suggested by both teachers and students as a way to improve the teaching and learning of biology.

4.5 Summary

This chapter presented, analysed and discussed data that was obtained from the questionnaires and focus group discussions. The data was presented in a blend of both quantitative and qualitative formats aided by tables, pie charts and bar graph. Therefore, it can be seen that, learners in Binga have a negative attitude towards learning of biology although some students revealed that they can learn but their efforts are being betrayed by the challenges that schools are facing. It also appears that inadequate biology textbooks, inadequate learning equipment and infrastructure faced by Binga schools are also major stumbling blocks to effective teaching and learning of biology. The following chapter will give a summary of the study, conclusions as well as the recommendations for the study and for future research.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter makes a summary of the study, conclusions and recommendations which can assist in improving the teaching and learning of biology basing on the findings from the previous chapter. The conclusion will be based on each research question following the findings of the study. Recommendations for further study will also be revealed in this chapter.

5.2 Summary of the study

The summary section condenses and highlights the findings of the study based on the data presented in the previous chapter on Data Presentation and Analysis. The study investigated the challenges faced by schools in the teaching and learning of Biology in Binga District, Matabeleland North Province. Many studies in Binga were conducted and there appears to be contradictions on the findings but most of which agree to the idea that lack of learning facilities, shortage of teachers and student's attitude towards science have a bearing towards teaching and learning. Furthermore, in line with the work of other researchers (Chagwiza et.al, 2013) this research adopted mixed approach and the collected data was largely descriptive in nature. There were 120 students and 3 biology teachers in the three secondary schools which were selected.

The data collection was first done through the questionnaires which were distributed to both students and teachers in the selected schools. In a bid to validate the responses which were obtained from questionnaires the researcher undertook a focus group discussion to address the elements that could have been left out by the questionnaires. The analysis of data of both quantitative and qualitative revealed that, the students in Binga District have negative attitude towards biology and also they are lacking basic learning equipment and proper infrastructure for effective learning of biology. The study has also found out that shortage of biology textbooks and lack of apparatus in Binga was some of the challenges faced by schools in the teaching and learning of the subject.

5.3 Conclusion

The results from this study suggest that secondary school students in Binga know that, Biology is an important subject and they are willing to learn given the opportunity that learning materials and proper infrastructure are made available. The Binga students exhibited a negative attitude towards learning of Biology. Findings from the study revealed that biology teachers face unbearable teacher-pupil ratio. This resulted in teachers bemoan high working loads which has made it difficult for teachers to manage their classrooms effectively, mark student's work and give quick feedback. Amongst a host of factors cited as reasons for the challenges faced by schools in teaching and learning of biology were: inadequate infrastructure and shortage of teachers, student's attitude towards biology, shortage of textbooks and large class size were found to have a negative impact to the teaching and learning of biology. Therefore, it can be concluded that teachers and learners are failing to perform to their maximum. In brief, from the findings obtained in chapter 4, the following conclusion was drawn:

- The physical infrastructure such as the laboratories were found to be inadequate in all the schools selected and there is also shortage of biology teachers in the majority of Binga schools.
- The negative attitude of learners towards biology has imposing a great bearing in teaching and learning of biology.
- Large class size has negative implications to the teaching and learning of biology as it imposes heavy workloads to the teachers and also making it difficult for them to attend to individual needs of the learners. Large class size also affects participation and concentration of learners towards learning.
- The possible solutions to the challenges faced by schools in teaching and learning of biology include: provision of adequate learning facilities like the biology laboratory, provision of enough biology textbooks for both teachers and the learners, teachers should also cultivate a positive spirit for learner to have interest in learning biology and the government should employ more biology qualified teachers in a bid to reduce the teacher pupil-ratio.

5.4 Recommendations

The need to improve quality in biology learning is of great importance bearing in mind the dismal performance in this subject in Binga district as a whole. As such the following recommendations are made from the study based on the research questions:

- (i) The schools should improve the state of their infrastructure through building science laboratories to facilitate effective teaching and learning of science subjects in the schools. The schools should also buy adequate apparatus and enough textbooks to improve teaching and learning of the subject. In the year 2009, UNICEF through Education Transition Fund (ETF) donated ordinary level textbooks for all other subjects at schools. However, the program did not donate both Ordinary level and Advanced level biology textbooks. Therefore, the schools have an obligation to buy enough biology textbooks in order to reduce the number of pupils sharing textbooks. The government should train and employ more science teachers to ensure that, there is effective teaching and learning of biology in schools.
- (ii) The teacher-pupil ratios experienced in schools need to be reduced in order to lessen the workload of the biology teachers and also enable students to participate effectively.
- (iii) Since the majority of learners generally regard biology as difficult subject, the biology teachers should teach the subject at a slower pace and at the same time show a lot of positive attitudes in form of patience to the learners. The teacher should also ensure that, they treat all the pupils equally, without showing a lot of positive attitudes towards fast learners only.

In a nutshell, the teachers should improvise on the resources available. The teachers should also use the simulation method in teaching science to make pupils visualize the concepts when experiments are not done or in the event that resources in the school are inadequate.

5.5 Recommendations for further research

The future studies on this subject should aim to investigate the effect of teacher qualification and experience on the student's performance in biology in Binga secondary schools. The Binga classrooms are mostly taught by the teachers who are not locals and not proficient in Tonga language, hence there is need to investigate the impact of the teacher classroom instructional language on teaching and learning of biology. The issues of gender and biology attitude should also need to be investigated in Binga District.

References

- Abrahams, I & Reiss, M. (2012). *Practical work: Its effectiveness in primary and secondary schools in England*. In *Journal of Research in Science Teaching*, 49(8).
- Altheide, D. L. & Johnson, J. M. (1994). *Criteria for assessing interpretive validity in qualitative research*, In *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage Publications.
- Amua-Sekyi, E. T. (2010). *Teaching in universities in Ghana: The tension and dilemmas*, *Ghana Journal of Education Teaching*, 9, 141-149.
- ATL. (2009). *School and class size matters, finds ATL survey, Annual Conference Report*
- Bailey, K. O. (1978). *Methods of Social Research*, London: Macmillan.
- Bahar, M, Johnstone, A. H. & Hannsel, M. H. (1999). *Revisiting Learning Difficulties in Biology*, *Journal of Biology Education*, 33(2).
- Benbow, J, Mizrachi, A, Oliver, D & Said-Moshiro, L. (2007). *Large class sizes in the developing world: what do we know and what can we do*. *Educational Quality Improvement Programme (EQUIP) and USAID*.
- Chigwamba, C. (2012). *Key note address at the curriculum review workshop, Speech delivered to the National Curriculum Review delegates on October 2012, Ministry of Education, Sports and Culture, Harare*.
- Cimer, A. (2012). *What Makes Biology learning difficult and Effective: Student's views*, *Education, Res, Rev*, 7(3): 61-71.
- Creswell J. W. (2014). *Qualitative inquiry and research design: choosing among five approaches*, 4th Edition, Thousand Oaks, CA: Sage Publications.
- Creswell, J. W. & Plano-Clark, V. (2011). *Designing and conducting mixed methods research*, 2nd Edition, Thousand Oaks, CA: Sage Publications.
- Cohen, L. (2008). *Research Methods in Education*, 8th Edition, London: Routledge.
- Copper, D. R & Schindler, P. (2003). *Business Research methods* 8th Edition, New Delhi: McGraw Hill.

- Gall, M. D. & Borg, W. R. (2007). *Educational research: an Introduction, 8th Edition*, London: Pearson Publishing.
- Gewirtz, B. S. (2000). *Bring the politics back in: Critical analysis of quality discourses in education, British Journal of Educational Studies, 48 (4) 332-370.*
- Gillham, B. (2000). *Case Study Research Methods*, London: Continuum.
- Gorge, M. (2013). *Teaching focus group interviewing: Benefits and challenges, teaching sociology, 41(3).*
- Grasha, A. (2010). *A Matter of Style: The Teacher as Expert, Formal Authority, Personal Model, Facilitator and Delegator, College Teaching, 42:142-149.*
- Ingersoll, R. M. (2001). Teacher turnover and Teacher shortages: An organization Analysis, *American Educational research Journal, 38 (3) 499-534.*
- Ingersoll, R. M. (2003). *The problem of under qualified teachers in America Secondary Schools*, Chicago: Chicago University Press.
- Khan, G. N. & Ali, A. (2012). *Higher secondary school student's attitude towards chemistry, Asian Social Science, 8 (6) 165.*
- Krueger, R. & Casey, M. A. (2000). *Focus group: A practical guide for applied science, Third Edition*, Thousand Oaks, CA: Sage Publications.
- Mertens, D. M. (2003). *Mixed methods and the politics of human research: The transformative-emancipatory perspective*, Thousand Oaks, CA, SA.
- Mertens, D. M. (2007). *Transformative paradigm: Mixed methods and social justice, Journal of mixed methods, 1(3) 212-225.*
- Morgan, D. (2018). *Living with blurry boundaries: The values of distinguishing between qualitative and quantitative research, Journal of Mixed Methods Research, 12(3).*
- Mutai, J. K. (2010). *Attitude towards learning and performance in mathematics among students in selected secondary schools in Bureti district, Kenya: Masters degree thesis.*
- Nasr, A. R. & Soltan, A. (2011). *Attitude towards biology and its effects on student's achievement, International Journal of Biology, 3(4) 100.*
- Ndlela, B. (2012). *Causes of poor performance by South African Students in mathematics and science*, Cape Town: Juta and Company.

- Nyambura, G. (2004). *Determination of discourse pattern that enhances Mathematics learning in selected secondary schools in Nairobi District*, Nairobi: Kenyatta University.
- Obodo, B. (2012). *School Curriculum*, New Jersey: Princeton University Press.
- Orion, N. & Hofstein, A. (1994). *Factors that influence learning during a scientific field trip in a natural environment*, *Journal of Research in Science Teaching*.
- Prokop, P, Tuncer, G & Chuda, J. (2007). *Slovakian student's attitudes towards biology*, *Eurasia Journal of Mathematics, Science and Technology Education*, 3(4) 287-295.
- Sarndal, C. E. (2003). *Stratified Sampling, Model Assisted Survey Sampling*, New York, Springer.
- Shulman, L. S. (1986). *Those Who Understand: Knowledge Growth in Teaching*, *Educational Researcher*, 15, 4-14
- Thomas, G. (2011). *How to do your Case study, A guide for student and researchers*, London: Sage Publications.
- UNESCO. (2006). *Teachers and educational quality monitoring global needs 2015*, Montreal, UNESCO Institute for Statistics, USA.
- Usak, M, Prokop, P, Ozden, M, Ozel, M, Bilen, K & Erdogan, M. (2009). *Turkish university student's attitudes toward biology*, *The Effects of Gender and Enrolment in Biology Classes*, *Journal of Baltic Science Education*, (2).
- Wasiche, J. L. (2006). *Teaching Techniques That Enhance Students Performance in Mathematics in selected public secondary schools in Butere-Mumias District*, Kenya: Kenyatta University.
- Wellington, J & Ireson, G. (2012). *Science Learning, science teaching, third Edition*, New York: Routledge.
- Yadar, K. (2001). *Teaching of life sciences*, New Delhi: Anmol Publication Limited.
- Yin, R. (2018). *Case Study Research, Design and Methods, 4th Edition*, Thousand Oaks, CA: Sage Publications.

APPENDICES

Appendix A: O-Level Biology Student's questionnaire

Biology Student's Questionnaire

My name is Bothwell Chawarura. I am a third year student at Bindura University of Science Education and I am doing a research project entitled: **Investigating the challenges faced by schools in teaching and learning of Ordinary Level Biology. Case of Siabuwa cluster of schools, Binga.** May you please kindly assist this research by responding to the questions by either ticking the appropriate box or writing in the spaces provided. The information obtained from this research will be used solely for academic purpose and be treated confidentially and it will also be processed namelessly. Your participation in this study is based on your consent. **Please do not write your name in this questionnaire.**

Section A (Please tick)

1. Do you have a science laboratory? Yes [] No []
2. Do you have adequate equipment for carrying out biology practical? Yes [] No []
3. It is difficult to participate in a large class? Yes [] No []
4. **Student's attitude towards biology.** On this part you are to decide carefully whether you strongly agree (SA), Agree (A), Unsure (U), Disagree (D) or Strongly Disagree (SD). Put a tick [] against each statement depending on your feeling. If you make a mistake, cross by putting(X) through the tick [] and then tick in the appropriate box below.

| Item | Student's perceptions about biology learning | SA | A | U | D | SD |
|------|--|----|---|---|---|----|
| 1 | Biology is difficult for me | | | | | |
| 2 | There are too many facts to learn in biology | | | | | |
| 3 | I am sure I can learn biology | | | | | |

5. What other problems do you come across in the teaching and learning of Biology?
Specify

.....
.....

Section B

6. What do you think are the possible solutions to improve the teaching and learning of Biology? Specify

.....
.....
Thank you

Appendix B: Biology Teacher's questionnaire

Biology Teacher's Questionnaire

My name is Bothwell Chawarura, a third year student at Bindura University of Science Education. I am doing a research project entitled: **Investigating the challenges faced by schools in teaching and learning of Ordinary Level Biology. Case of Siabuwa cluster of schools, Binga.** May you please kindly assist this research by responding to the questions by either providing a tick in the appropriate box or writing in the spaces that are provided in this questionnaire. Your participation in this study is based on your consent. The information that will be obtained from this research will be used solely for academic purposes and be treated confidentially. The individual answers will not be disclosed and will be processed namelessly.

Please do not write your name on this questionnaire.

Section A: (Please tick)

1. Do you have adequate laboratory equipment? Yes [] No []
2. What is the general attitude of your students towards learning of biology? (a) Very Positive [] (b) Positive [] (c) Negative [] (d) Very negative []
3. Are you a trained biology teacher? Yes [] No []
4. What is the effects of large class size in teaching and learning of biology? Please tick

| Item | Effects of large class size in teaching and learning | Yes | No |
|------|---|-----|----|
| 1 | Large classes affect teaching and learning of biology | | |
| 2 | The larger the class the more difficult to manage | | |
| 3 | Is there any convenience in teaching biology in a large class | | |

5. What other problems do you come across in teaching and learning of biology?
Specify

.....
.....
.....

6. What do you think are the possible solutions to improve teaching and learning of biology in schools? Specify

.....
.....
.....

Thank you

Appendix C: Focus Group Discussion Questions

1. Can you comment on the adequacy of science laboratory equipment at your school used in the teaching and learning of biology?
2. In what ways does your teacher affect your attitude towards learning of biology?
3. Can you share your experiences in participating in a large class?
4. Why there is shortage of biology teachers in Binga District?
5. What do you think are the possible solutions to improve the teaching and learning of biology?

Appendix D: Authorisation Letter



